Information Systems Office Overview

Tom Swartz - Director
Troy Crites - Deputy Director
Dave Signori - Deputy Director

Providing advanced information systems to give warfighters knowledge that will transform warfare and ensure U.S. supremacy in the 21st Century

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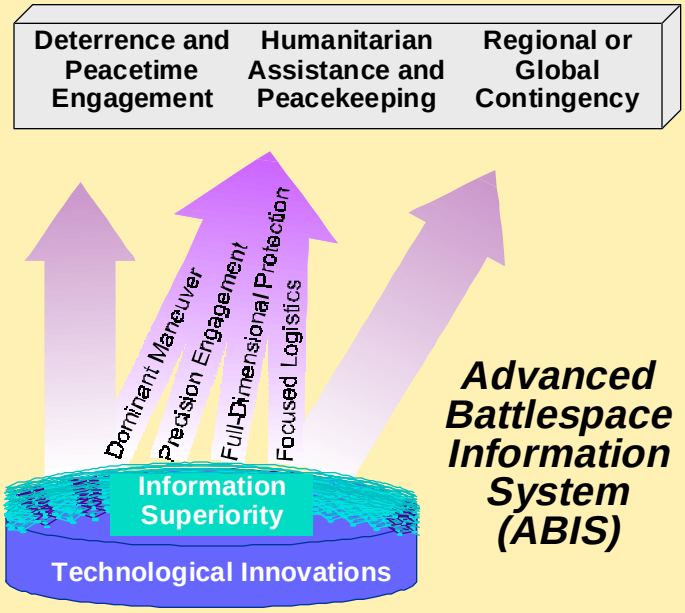
I'm Tom Swartz, Director of the Information Systems Office, and there are two Deputy Directors (Troy Crites and Dave Signori) as shown on this chart. The short statement on the bottom of the chart is a summary of what we are trying to accomplish in ISO and I will have more to say on both office objectives, strategy and programs.

Joint Staff Vision 2010

DARPA
ISO

- Synergistic convergence of new operational concepts
- Critical C²I capabilities to enable coherent joint operations
- Massed effects from dispersed forces



Advanced Battlespace Information System (ABIS)

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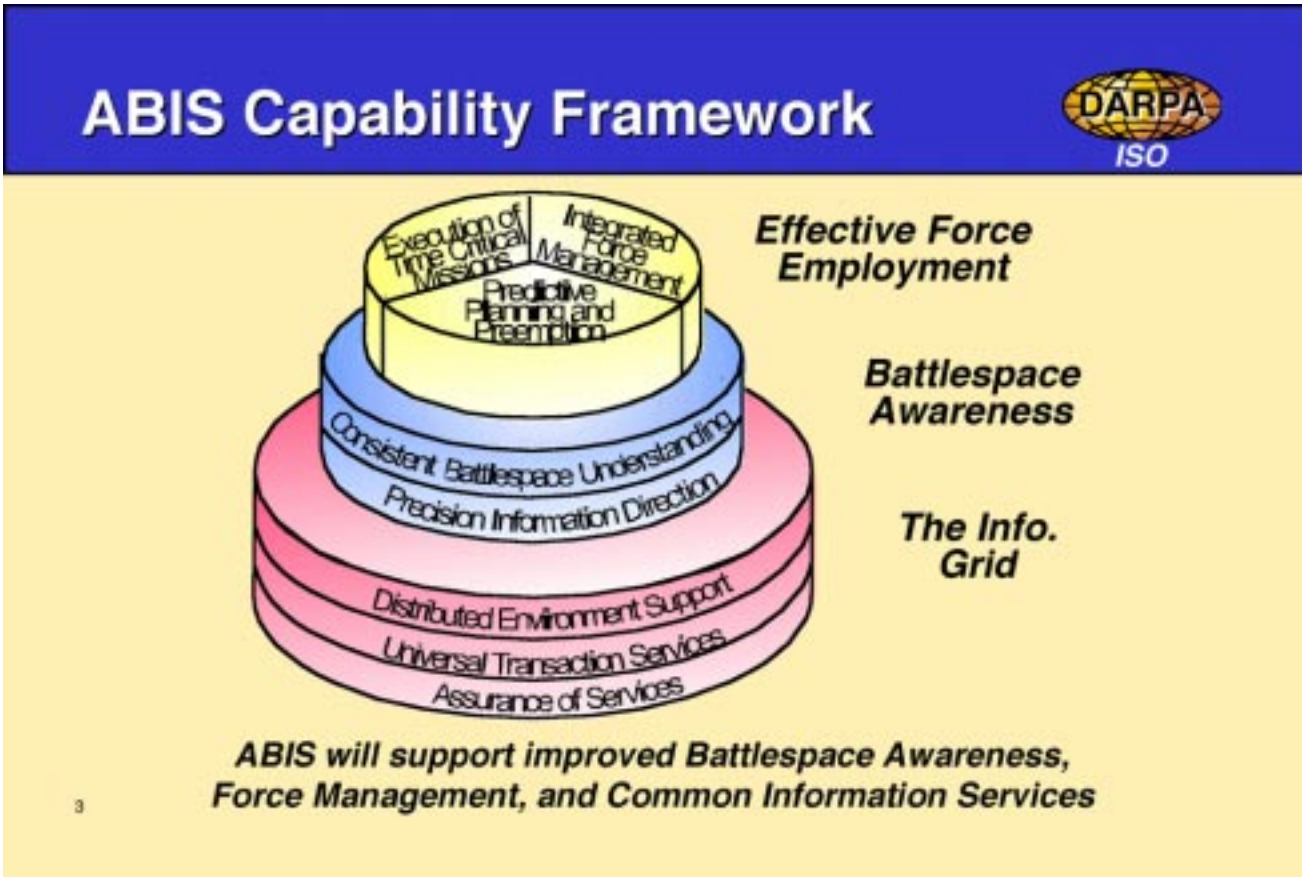
In order to understand where we are headed within ISO, it is instructive to understand where the Department is focused. This slide shows the essence of the Chairman's Joint Staff Vision 2010. There are several points that I would like to make with this chart, starting from the top. To no one's surprise, we will encounter a wide variety of warfare scenarios. The impact of a wide variety of scenarios on ISO technology is profound. To date, all the Command and Control programs contain a substantial number of "rule based" applications which are neither visible to the operator nor changeable by the operator in the field. The future challenge is to build applications which the operator can adapt to the exact scenario. We can build case studies which are generally correct, but specifically wrong, and let the operator modify the application to the specific task. Shown supporting the Conflict Spectrum are the four major thrusts - Dominant Maneuver, Precision Engagement, Full-Dimensional Protection and Focused Logistics. I don't plan to say much about the major thrusts but will have a few words to say about Logistics later in the briefing. Supporting the four major thrusts is the concept of Information Superiority. Information Superiority means many things to many people, but I choose to think of it as having two major pieces, Battlespace Awareness and Force Management. Each of these two concepts is critically important to any future battlefield and was the subject of the Advanced Battlespace Information System (ABIS) study which was headed by Dr. Anita Jones and Adm. Cebrowski. I look at the ABIS study as an investment strategy to gain information superiority. The three bullets are the operational attributes which information superiority should enable, providing we can implement the investment strategy. The results of the ABIS study are shown on the next chart.



The three major areas addressed by the study from bottom to top are: the Grid; Battlespace Awareness; and Effective Employment or what I referred to as force management. Each of the areas is critically important to implementing the concept of Information superiority. The Grid is the fundamental building block which must have the robustness (adaptive bandwidth) to support a heterogeneous environment. An additional growing concern is the availability and security of the grid as we become more dependent on it to transfer large amounts of data. On top of the grid, and an integral part, is a distributed support environment which supports distributed processes, information search, collaboration, and others. The importance of Battlespace Awareness has been well understood for some time, but the increased volume of data will stress our ability to exploit the data, fuse the information, and display the information in a concise understandable manner. The need for a precise consistent view of the battlefield is a keen area of interest and research in the coming years. The culmination of information superiority is then focused on Force Management. It consists of Integrated Force Management to include Predictive Planning and Preemption. The overall motivation is to gather the data, fuse the information, develop the plans to include course of action analysis, and execute the mission inside the enemy planning and execution cycle.

ISO Vision for the Warfighter

A future battlespace where every commander can . . .

- Employ just the right amount of force at just the right place and time
- Create battlespace dominance and destroy his adversary's will to fight

Because every commander has . . .

- A comprehensive view of the battlespace shared with all his forces
- An ability to rapidly and continuously plan and execute highly integrated joint operations
- Access to a synthetic battlespace for evaluation of courses of action and the training and rehearsal necessary for successful operations
- A supporting information environment that can be rapidly adapted to the situation and tailored to the needs of the commander and the executing forces

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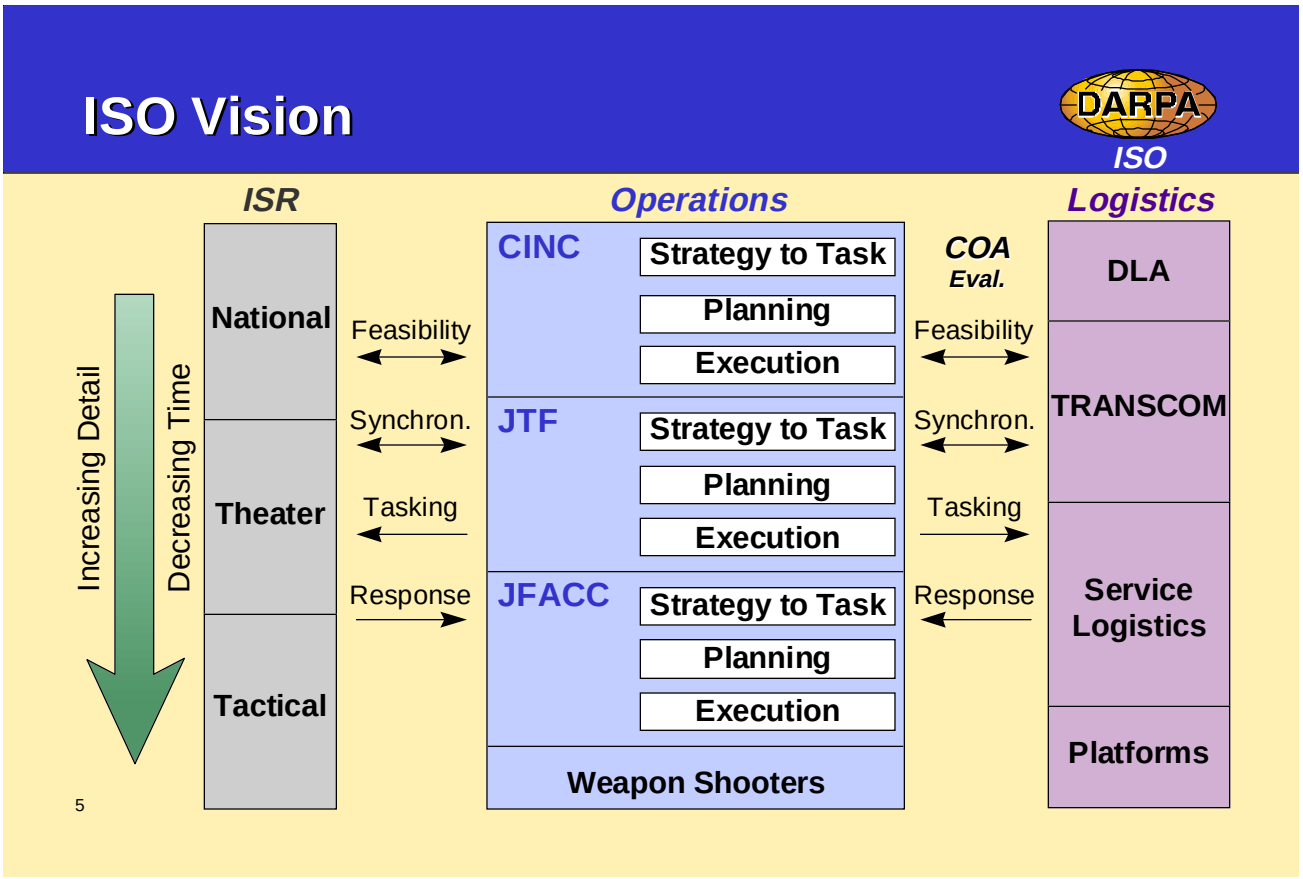
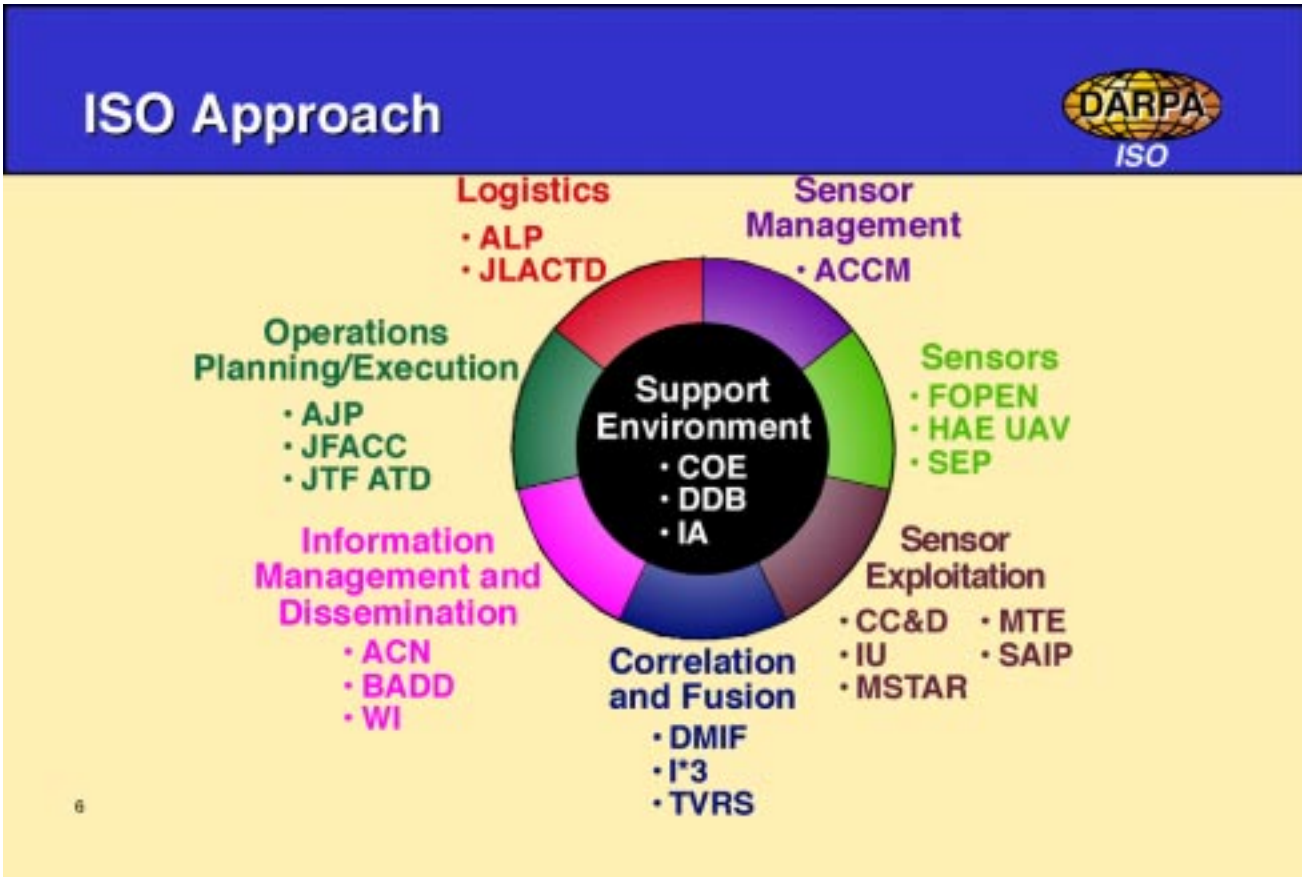
The value of this chart is that it gives you some insight into the overall strategy and thinking within the Office. As you can see, there is a heavy emphasis on timely Battlespace Awareness and Force Management in the capabilities described in the Commander's vision. The four bullets described under every Commander mirrors the major elements of the ABIS Study and is precisely how the office is currently organized.

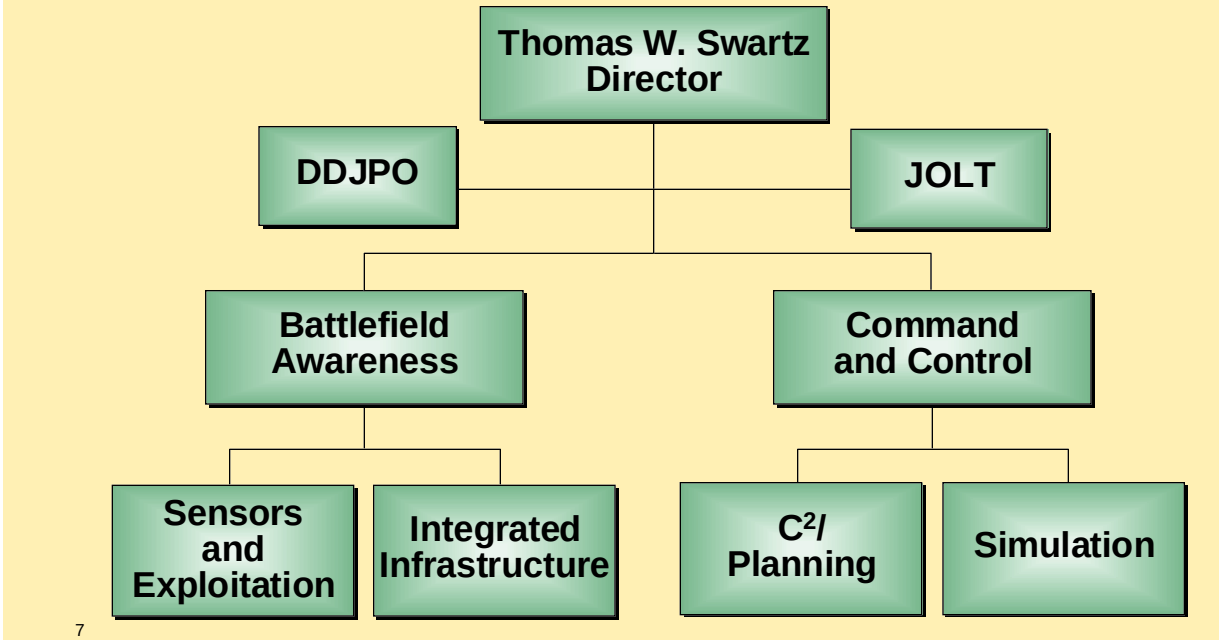


Shown on this chart is a fiscally constrained view of what we think can be accomplished within the next few years. Briefly it includes the vertical and horizontal integration of the J2, J3, and J4. The vertical integration includes tracking strategy to task from the CINC down through the JTF to the Joint Component level. The horizontal integration is the seamless flow of information between Intelligence, Operations and Logistics. Due to the fact that we have limited funds, we have drawn an operational thread through our programs to demonstrate the military utility of a highly integrated system. In order to integrate these efforts, we need to have an architecture and schema which could be used to support the application. We selected the Distributed Object Computing environment (CORBA) which was under development in the Joint Task Force ATD and decided to expand the Schema under development within that same effort. Our best guess was that Distributed Object Computing was the wave of the future. We selected CORBA because it was commercially supported by multiple vendors and, additionally, we saw the need for syntactic interoperability requiring common schema.



This is another way to look at the flow of information between programs and their relationships. At the center of this chart is the support environment which includes the Common Operating Environment, Information Assurance and the Dynamic Database which you will hear about later. We start the discussion with sensors, where we are pursuing Foliage Penetration Radar and an Emulation Sensor for the Tier II+ program. The Emulation Sensor will be used to collect data, as well as, be a surrogate for demonstration testing. Sensors is followed by Exploitation where we have a full spectrum of programs ranging from exploratory work in Image Understanding, to early efforts in model-based ATR (MSTAR), to demonstration effort (SAIP). Additional efforts explore the exploitation of Moving targets and targets which employ countermeasures. Exploitation is followed by Correlation and Fusion where we have data retrieval efforts and the Dynamic Multi-User Information (DMIF) program. These efforts fuse and tailor the information for the user. This is followed by Information Management and Dissemination. The overall objective is getting the right information to the right user in time. Battlefield Awareness Data Dissemination (BADD) is concerned with both information management and dissemination, while the Airborne Communication Node (ACN) and Warfighters Internet (WI) are principally focused on providing a robust communication grid. The information is then passed to Operations Planning and Execution where we have several efforts which we are fully integrating: the Joint Task Force ATD, the Joint Forces Air Component Commander (JFACC), the Advanced Joint Planning ACTD, and the Advanced Logistics program. The circle is then completed by assessing what additional information is required and tasking the sensor suites to obtain the data, we have called that Sensor Management. I will say a few more thing about most of these efforts in a minute.

ISO Organization



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I show this organization chart so that you might see the relationship between program areas and the importance of efforts. As you can see from the chart, we have a very close relationship with the DARPA/DISA JPO and the Joint Office for Logistics Technology (JOLT). The DDJPO is a key transition path for our technology and the JOLT office is coordinating much of the new technology in the logistics community. As you can also see, we are organized into Divisions similar to the four major bullets in the ISO vision slide. I will now show one slide on each of the divisions and briefly describe their efforts and approaches.

Sensors and Exploitation

DARPA
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FOPEN /CCC&D	ATR Demonstrations
■ Wideband low frequency radar ■ Compatible with UAV hardware ■ On-board processing ■ Compatible - SAIP/BADD/CIGGS ■ Multi-spectral imaging	■ Semi-automated processing ■ Cue to isolated targets ■ Recognize force structure ■ Rapid report generation ■ Site monitoring - SAR and EO
ATR Technology	**Moving Target Exploitation**
■ Model-based ATR ■ Reduction in processing load ■ Handle articulated targets ■ Large target-based ■ Bandwidth compression	■ Movement pattern analysis ■ Behavior pattern analysis ■ 1-D profile matching ■ 2-D imaging - templating

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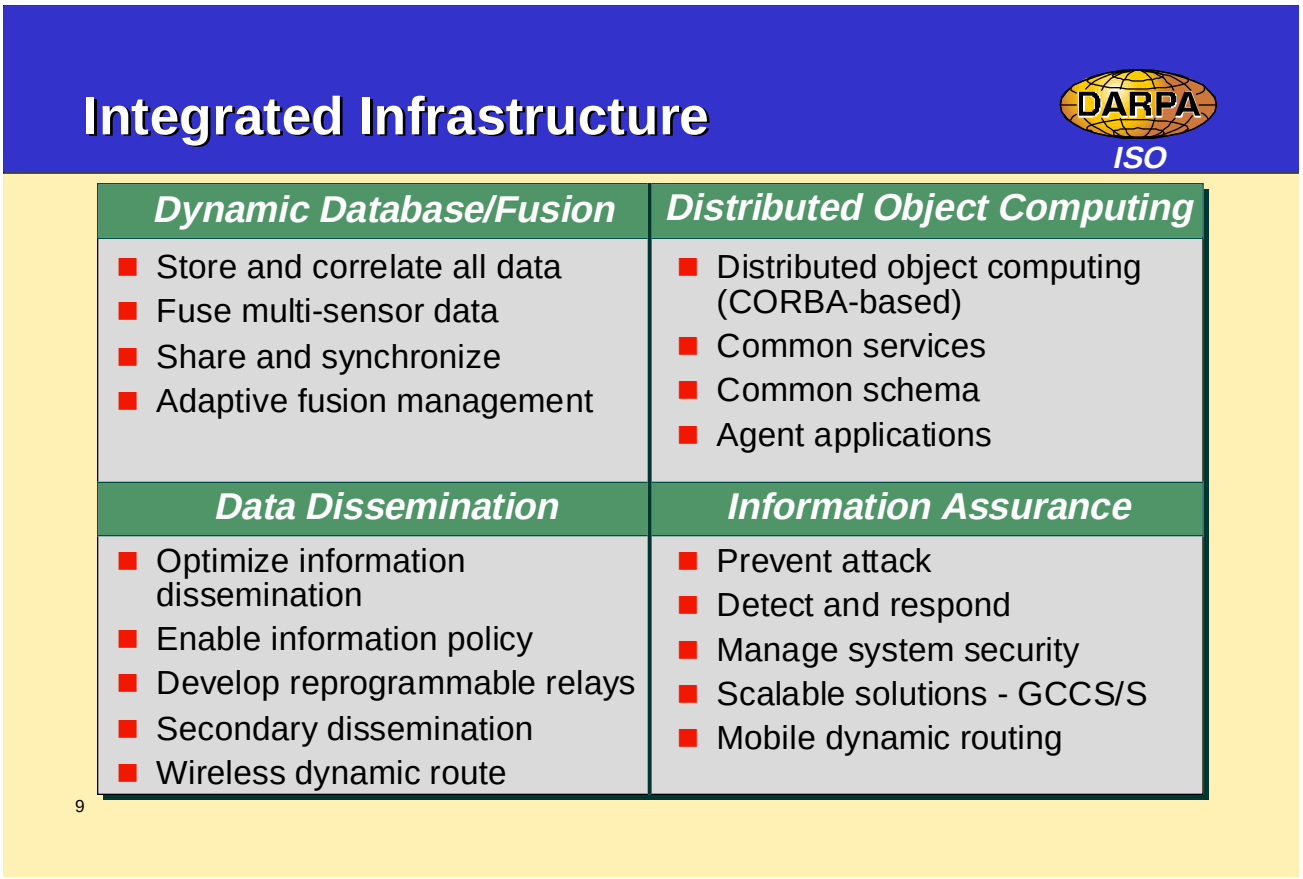
In the sensors area, we have just one effort which is aimed at demonstrating the ability to detect and classify targets under foliage- we think it will also work under camouflage. The approach is to use a very wideband low frequency radar, potentially both VHF and UHF, and demonstrate it in a configuration which is 80% compatible with the Tier II+ configuration. The exploitation area will have an architecture which is both SAIP/CIGGS compatible and will be indexed so that it is easily retrieved by BADD and other retrieval schemes. The effort will also share data with Multi-spectral imaging efforts to look at the feasibility of cross cueing from FOPEN to MSIR/HSIR. The ATR effort is divided into an exploratory effort and a demonstration effort. The demonstration effort is named SAIP for Semi-Automated Imaging Processing. The objective of SAIP is to put the technology in the field that has been developed over the last 15-30 years and get some user feedback on its Military utility. The effort is designed to cue the Image Interpreters to isolated targets and recognize force structures more rapidly. To insure rapid turn around, semi-automated report generation has also been included. While the effort concentrates on Radar wide-area imaging, it also includes SAR and EO site monitoring. The exploratory ATR technology is investigating the use of model-based ATR techniques which have the potential to dramatically reduce the processing load when considering large target sets which contain articulated targets. Additional efforts within this category include Bandwidth Compression techniques to preserve image quality while reducing downlink bandwidth requirements. The final effort is the exploitation of Moving Target Indication (MTI) data. The primary emphasis is on the exploitation of Movement Pattern Analysis and Behavior Pattern Analysis. This approach is to classify units/groups of vehicles based on their observed movement pattern. It will include proactive detection and classification of groups of vehicles without the benefit of time-lapsed replay. Small efforts are also addressing the classification of vehicles using 1-D profile matching and 2-D imaging and pattern matching.



The things we have defined as Infrastructure are those elements of the program which are fundamental building blocks of any system construct and that have applicability across a number of efforts. It's of course an imprecise definition. The most fundamental of all of these efforts is the architecture which we have chosen as a Distributed Object Computing (DOC) Architecture and have selected the evolving CORBA standards as the basis for our future work. CORBA has a number of nice features (open, robust, etc.) and, whether it is commercially successful or not, we will have learned a lot about DOC and the ability of DOC to enhance the functionality and flexibility of advanced military application. Estimates to change to another DOC environment are modest. Key to an integrated architecture and set of applications in a Common Schema and we are spending considerable time developing/expanding the schema. Additionally, we know the architecture has to expand and are looking at the incorporation of agents into the architecture and that will be one of the future focuses. A key attribute of the architecture should be the incorporation of security. We have started a system level program to integrate security into the architecture and network. We will adopt/ modify commercial packages as well as advanced technology applications from our sister Office ITO, integrate them into a testbed and evaluate the system utility in a systematic way and feed back the result to developers. We will approach Security as a systems issue and provide a balance of capabilities which should provide a level of defense in the not too distant future. Another core issue is Data Dissemination and we have three efforts within this area which are addressing either the communication infrastructure or optimal dissemination of information. The Battlefield Awareness Data Dissemination ACTD is primarily concerned with optimal distribution of information across the battlefield, implementing the Commanders information policy, enabling dissemination to coalition partners and distillation, filtering, and presentation of information to the warfighter. Other programs in this area include Airborne Communication Node and the Warfighters Internet which will

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be discussed in later presentations. Suffice it to say that the ACN provides a wideband bent pipe in the sky for the dissemination of information and WI provides the packet switching overlay which optimizes the use of bandwidth.

Command and Control Planning

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Joint Forces Air Component Cmdr	AJP ACTD / JTF ATD
■ Integrated campaign management ■ Near real-time replanning ■ Work flow management ■ Collaborative workspace	■ Crisis management tools ■ Readiness evaluation ■ Deployment toolbox ■ Map-based planning
Genoa	**Adv Logistics Program / JOLT**
■ Secure virtual workspace ■ Data mining/web browsing ■ Data fusion and management ■ Decision and briefing aids	■ Automated log planning ■ Execution monitoring ■ Replanning and visualization ■ Visibility

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Shown on this chart is 2/3 of what we are trying to integrate within the office i.e. the J3 and J4 portions of the Technology. Starting with a hierarchical viewpoint, the Advanced Joint Planning ACTD is putting the crisis management tools in place for evaluation by Atlantic Command. The tools currently deployed are those shown on the chart (Readiness Evaluation, Deployment Toolbox (for developing and modifying TPFDD, etc.), Map Based Planning and a few other applications. The fundamental develop work for the ACTD, including the architecture, was conducted in the Joint Task Force ATD sponsored by Pacific Command. The AJP ACTD is coming to a close on the development effort and will support evaluation by ACOM over the next two years. The JTF ATD will mature the architecture and transition it to DISA over the next two years . The Joint Forces Air Component Commander (JFACC) effort is developing the JFACC which will be integrated with the Theater Battle Management Core System TBM/CS. The JFACC effort will automate much of the air campaign planning, fully integrate all aspects of air space planning, and provide the capability to do real time replanning, to include retasking of planes in the air. The system is designed to rapidly provide the commander with the impact to his plans based on the diversion of sorties as well as a rapid replanning capability. High priority tasks are quickly processed and lower priority tasking are delayed as determined by the Work Flow manager. The Advanced Logistics Program and the Joint Logistics ACTD are centered within the Joint Office for Logistics Technology (JOLT) . There are many detailed issues in logistics, but the essence is to automate and increase planning details so they can be compared with the execution phase of the operation. In other words, we want sufficiently detailed data so that we can monitor the execution phase of the program and determine whether we are deviating from the plan. When deviations are noted, replanning is triggered so that the plan has minimum latency. Visualization of information will be an important part of the program, so that the data can be quickly absorbed. Another key part of the effort is to provide the end item user visibility

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into the plan so that he/she gains confidence in the systems and not order additional material for fear that they might not get their allotments. Last, but not least, in this area is Genoa which is one of the most technically challenging efforts we are doing in this area. This is an effort to support the National Security Council and provide them with the capability to work with numbers of dispersed individuals in a secure and physically dispersed environment. More importantly, it provides the tools to automatically review multi-media information, select key aspects of the data, and fuse the data into information which might indicate a emerging crisis situation. This is a very challenging effort and will determine where we stand in a number of key technology areas.

Simulation

DARPA
ISO

Defense Simulation Internet	Synthetic Theater of War
■ Commercial ATM services ■ ATM encryption (FASTLANE) ■ Multicast technology ■ Quality of service	■ Distributed synthetic battlespace ■ Integrated with C4I systems ■ High level architecture compliant ■ Live, virtual, and constructive ■ Transition to JSIMS
Advanced Simulation Technology Transition	**Course of Action Evaluation**
■ Automated scenario generation ■ Synthetic natural environments ■ Human behavior representation ■ Scalable executing systems	■ Integrated with planning function ■ Simulation-based technology ■ POP prototype/Army Commander ■ Explore other applications

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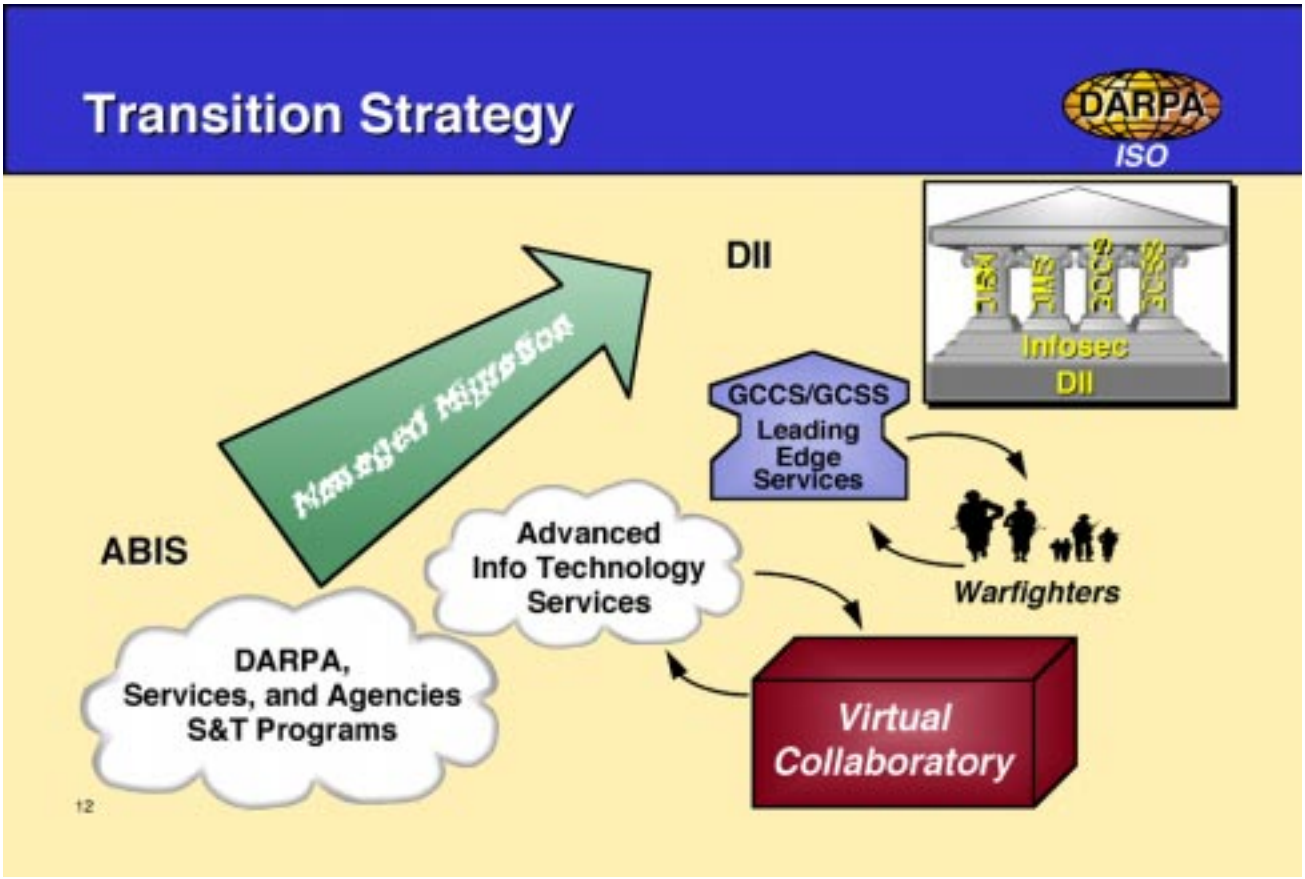
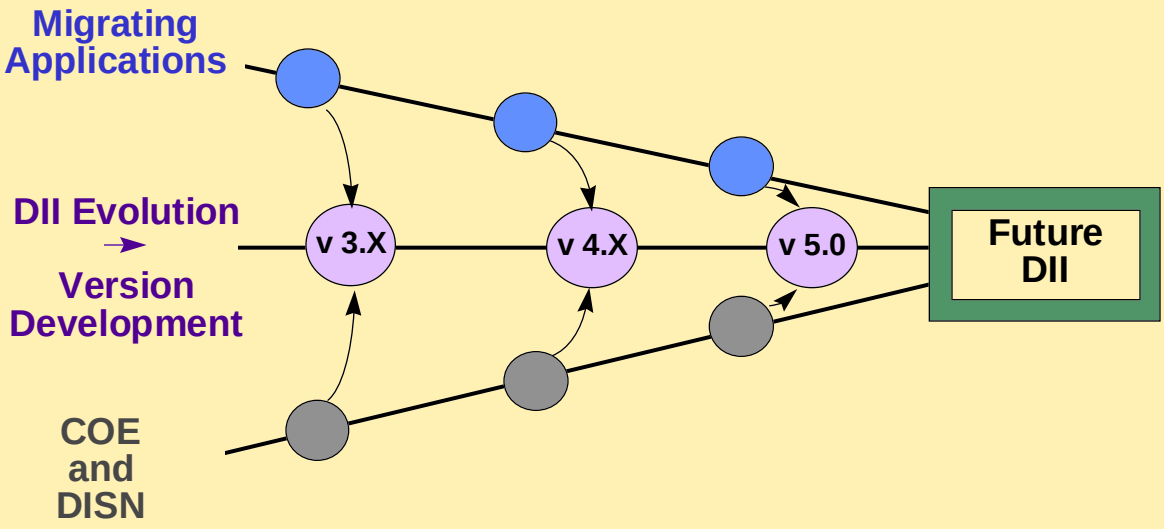
We are on a exit strategy from the simulation for training business. The Defense Simulation Internet was a very successful program which has transitioned through the DARPA DISA JPO and is now a deployed service. The Synthetic Theater of War (STOW) ACTD demonstration will be with ACOM in late November this year and it will be supported for an additional two years for operational evaluation. The Advanced Simulation Technology Transition (ASTT) is designed to develop the gaps in technology between STOW and JSIMS. The ASTT program is addressing the four technology areas outlined on the chart (Automated Scenario Generation, Synthetic Natural Environments, Human Behavior Representation and Scalable Executing Systems). This effort will continue through FY99. The Course of Action Evaluation program is a small effort to investigate the use of simulation based technology integrally tied with the planning function. The vision is to have the course of action evaluation continually running in the background of the planning system. There is a Proof of Principle prototype that is being built for the Army Ground Commander. If this demonstration is successful, we intend to explore a greater array of applications.



A key question is how do we transition the technology from DARPA to the customer. Because many of our products are software application, we have formed a strategic alliance with DISA and formed the DARPA DISA Joint Program Office. The original objective of this office was to transition DARPA technology to DISA, to, if you will, do the Engineering Development (hardening) on products from DARPA so that they were supportable in the field. The charter is in the process of being expanded to include the same functions for the Services and other agencies. Shown is a natural progression from internal development, to advanced architecture, to integration into the GCCS leading edge services and then to the DII. A key aspect of the transition is the Virtual Collaboratory where early adopters in the user community can experiment with the new application and provide assessment of military utility.

Transition Roadmap

DARPA
ISO



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The transition process is further complicated by the fact that the DII is evolving and needs to evolve as technology progresses. The DII is scheduled to evolve on about an 18 month interval with the assurance of backward compatibility. The task is then to gage the length of your development and target them for future releases. We have done that task in great detail for both the Common Operating Environment efforts and Application efforts and are hopeful that this will all come together as planned. We have portions of the Distributed Object Computing COE primarily scheduled for releases 4.0 and 5.0 with application spread across releases 3.0, 4.0 and 5.0. As you can see this is an interesting management challenge, but it is critically important that we learn how to manage evolution or the DoD will forever be relegated to last generation technology.

Summary

DARPA ISO

- Focus is on information dominance
- ISO has taken the vision and established a strategy to achieve it
- Programs are on track to achieving individual goals
- Key transition issues are being addressed
- Architectural issues need to work alongside programs
- Key challenges remain

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We have made good progress since I talked with you 18 months ago. Our strategy to integrate our application both vertically and horizontally is in progress and going well. We don't have concrete results to date which indicate the military utility of highly integrated systems, but it appears on track. The transitions are in hand and work with the DDJPO is on a daily basis. For the system to evolve, the architecture needs to evolve and we are also addressing that issue. But with all the success, there are many unsolved issues and some very hard problems. We need your support and solicit your help in identifying the hard problems and solving them.